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WHAT ATE THE MULLEIN?

It was to me a strange thing to see the odious mullein preyed upon by some herbiverous creature. From my earliest childhood I had thought the mullein the most useless of weeds, obnoxious to all creatures because of its odor, and useful only to young misses to "try their fortunes" by breaking its stalk. I never knew cattle, sheep, or any other animal to take a mouthful of it even by mistake. So when it appeared on the field with many of its leaves eaten away along the outer portion, or cut off smoothly and lying beside the plant, and with sometimes half the bud eaten away, curiosity to know what did it caused the following investigation.

At this season of the year (fall) the mullein grows in the form of a dense rosette (see Fig. 1, *a*), and may be found of nearly any size ranging from four inches to almost two feet in diameter. This plant was not found on moist areas. The field that we studied contained a few mullein in the southeast corner only. This was the highest and driest of the entire field. It seems strange that a plant as bulky as the mullein, and apparently needing a great deal of water, should confine itself to such dry ground. Fig. 1, *a*, shows not only the rosette arrangement of leaves, but also how these are packed one upon the other, four, eight, and even twelve deep. The edges of the leaves, except in the outermost ones, are turned toward the sun, thus preventing by arrangement rapid evaporation. The leaf has also another contrivance to prevent its drying. The leaf, itself thick, is covered with something like fine wool, which gives it a whitish appearance. This makes the packing of the rosette snug, really suggesting warmth. A portion of this, placed under the microscope, resembled a dense, tangled forest. The surface of the leaf forms the ground, and the woolly covering the thicket. The fibers or threads were so matted together that it was hard to separate a single portion, or to examine it minutely. It appeared, upon closer examination, as pictured in Fig. 1, *b*. A single stalk divided into three parts, each of these again into three, then each of these again and again. The usual number of divisions into threes was five. As these stalks were close together, they gave to the leaf a large surface area for dew deposit at night. Every morning the entire forest would be found flooded with water, and overflowing in great beads of dew. Because of the leaf arrangement, it required hours for the sun to dry this out. That, then, is a second contrivance to conserve moisture. Under the microscope these threads appeared but the expansion of the epidermis filled with sap.

Every morning for more than a week I examined the mullein, and again in the late afternoon, but no sign of life could be found, except a little green beetle so nearly its color that it could scarcely be seen. The week was a very cool one. The conclusion was that, if the animals were still there, they fed either at midday or after nightfall.

Saturday was a warm, clear day, and, going out at high noon with the glass, I soon discovered three kinds of depredations, illustrated by Fig. 1, *c* and *d*. In *c* is shown a leaf eaten away or cut off at the apex, also with a portion eaten out of one side. Many of these cuts were fresh, so that it was evident that the animal lurked still somewhere about the field. In *c* is represented a leaf punctured in several places. The conclusion was that they had been made some time before, and the animal had disappeared, or that they were now being made in the younger leaves to increase in size with the growing leaf. In *d* is shown the third kind. This is a young leaf showing various roads cut through its woolly thicket, and the wool rolled up in balls at its base. This injury was surely done by an entirely different animal that cared not for the fiber, but only for the juice.

In the warm bright sunshine there soon was found a mullein infested with little green plant lice. These so closely resembled the color of the plant that, though they existed in great colonies, it was difficult to see them. They were sucking the juices from the little fibers, but there were no traces of their responsibility for the fiber's being cut away. With the discovery of the plant lice came also the discovery of ants following them up. Soon, too, with these were found lady bugs, one of which showed distinctly that she was there for a nice green dinner of fresh aphids. Here, then, was a little colony of animals subsisting on the mullein, but none of which could be held to answer for the injuries noticed.

Close examination of the tender leaves with the microscope revealed what seemed to be a little yellow grub which had apparently eaten its way half through the tender leaves and remained

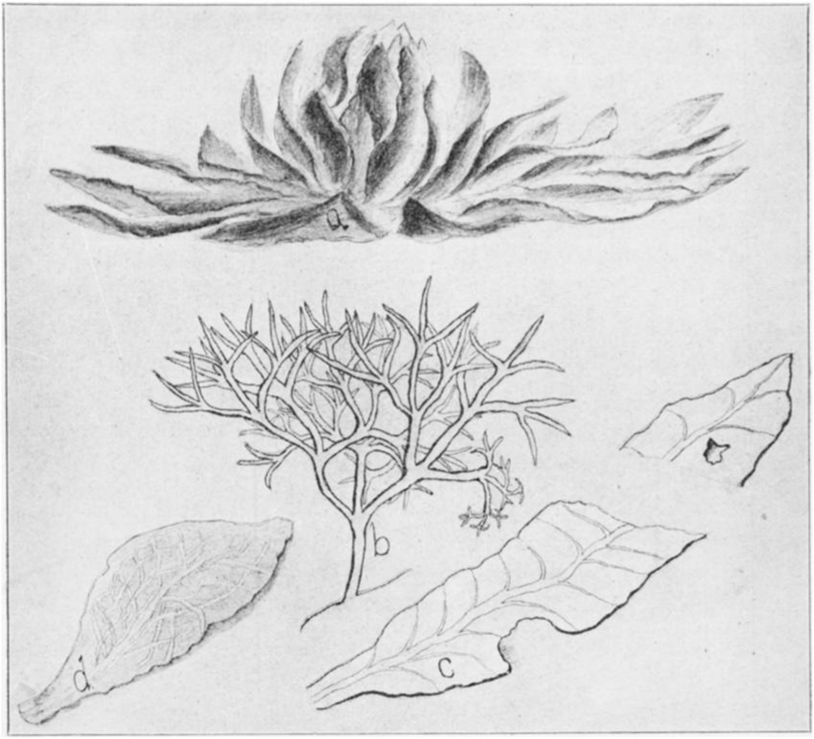

FIG. 1.

suspended midway of the aperture. This grub was then responsible for the punctured leaves. This small hole, made in them when so young, had increased as the leaves grew larger, until its brown, ragged edges greatly marred the perfectness of the plant. So many of these grubs were found in apparently the same position that it awakened suspicion. Closer investigation under the compound microscope disclosed them to be eggs, not grubs. These had been each placed in a puncture of the leaf and suspended midway. It could not be determined whether they were attached by a glutinous fluid, or held by pressure of the leaf on its sides. They did not fall out at the removal of the leaf from its stem, and their delicacy of balance gave them the appearance of being alive. These eggs consisted of a clear liquid covered with a yellowish, honey-combed shell. (See Fig. 2, *c.*)

Farther in the bud the leaves were covered with small black specks which looked like little black "oat mites." To the naked eye these appeared as particles of soot changed by every breath of air. They were wriggling and making their way through the forests of fiber, cutting it off and rolling it up before them as they advanced. This explained the roadways through the forests and the little balls of woolly fiber at the leaf stems. Clearly they had not cut this to feed on. Perhaps they wished to drink the juice which flowed from the cut tubes. This, however, could be only partially true, for the rapidity with which they cut the fibrous tubes and the free flow of sap furnished them a stream to swim in rather than a mere liquid drink.

The eggs and mites were both far in the interior of the bud, where harm could not easily come to them. Once when a bud was carefully opened a small brown bug was seen hurrying away between the leaves toward the ground. It disappeared so quickly that it reached the earth without being caught. Then it was almost impossible to see it, because its color was almost that of the dark-brown earth in which the mullein grew. That was a signal for greater care in opening the buds. Soon many of these bugs were discovered either on the edge of the leaf or down in the bud on the leaf's upper surface (see Fig. 2, *a*).

These bugs were furnished with suctorial mouths about half the length of their bodies. They also doubtless lived on the juices of the mullein, though they did not cut roads through it. Along the edge of the leaves where they were found the fiber was freshly cut away. Some of these bugs were furnished with an apparatus in the abdomen for puncturing the leaves to deposit their eggs. The eggs found, might be the eggs of this bug, but why were the mites with them? The characteristic mark of the mites was a white streak down the back, which at times fairly glistened.

When placed under the compound microscope, they appeared as in Fig. 2, *b*. Surprisingly enough, they were the larvæ of the bug found, and had doubtless hatched from those suspended eggs. Like the bugs, these larvæ had a pair of antennæ on the front of the head, and the body divided into three distinct segments. To the middle segment were attached three pairs of legs, each furnished with a pair of large, flat disks instead of feet. The white streak down the back was the undeveloped wings, fringed so as to act as swimmerets, or gills, perhaps both. The purpose could not be exactly determined. The wings were fastened together about a third of the way down the abdomen, and the other two-thirds of the way they were free and in continual motion. This shows why they glistened at times. This helps to explain also why they cut away the juice-filled fibers so rapidly, and why they acted so strangely when out of their regular pathways.

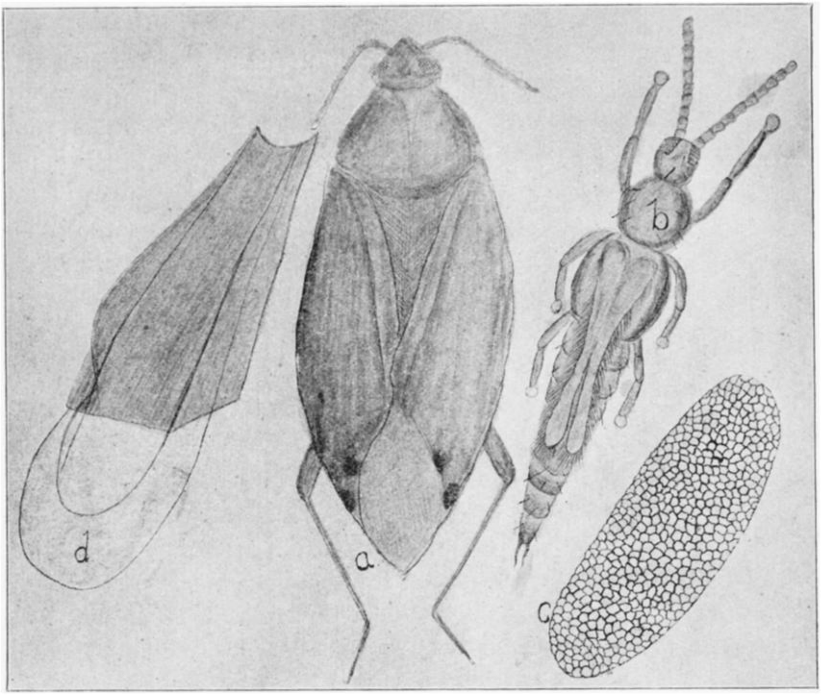

FIG. 2.

Here was a second colony. Its members were evidently to blame for the punctures and roadways; but what had cut those large leaves?

Down among the larger stems near the stalk, and on the ground about the root of the plant, many dead crickets and grasshoppers had been found. It seemed plausible that during the cold nights of the past week they had crawled into the soft mullein for protection, and had either frozen or been eaten by the same animal that had eaten the mullein; for many of them were but empty shells. On a freshly cut mullein careful search was made, but nothing was found except a live grasshopper stowed away in the warmth of the leaves for the night, as it was now growing late and cool. All the freshly cut plants were searched, but still nothing was found except either live or dead crickets and grasshoppers. Imagine my surprise to see a live grasshopper, sitting cosily among the leaves, munching away at a supper of mullein. This, then, was the marauder I had so long searched for and had least suspected. Probably driven by the death of other vegetation of which he is fond, he had begun to feed on this loathsome mullein, and to take shelter under its warm leaves at night, where he died either of cold or of a ripe old age.

This was the third group.

Several other insects were discovered, but between these and the mullein nothing but an accidental relationship could be discovered. There were some little gray moths, such as one usually finds upon dying vegetation at this season. There were in many instances flies; these were accompanied, with one exception, by spiders hiding among the lower leaves. In some cases the spider had a web almost completed. A few gray coleopteræ were found among the leaves.

The bug discovered in the second group, after examination of the wing (Fig. 2, *d*), was classed with the family Capsidæ, order Hemiptera. This is a large family, popularly known as leaf-bugs. No description of this particular species could be found.

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